REMARKS

In the present Amendment and Response, Applicants have amended the claims and Specification to bring the terminology used to describe the invention in compliance with the IUPAC definition of "mesopore". In view of the recent decision by the Federal Circuit, *Texas Digital Sys., Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1202 (Fed. Cir. 2002), where the court held that claim terms are to be given their ordinary and customary meaning as found in the relevant reference materials, Applicants have amended the Specification and pending claims to remove any possible ambiguity that may arise in view of the IUPAC definition of "mesopore". IUPAC defines mesopore to mean those pores having a width between 2nm and 50 nm. *See* "mesopore (in catalysis)" IUPAC Compendium of Chemical Terminology, 2nd Edition (1997), located at < http://www.iupac.org/goldbook/M03853.pdf> [attached as Exhibit A].

As previously stated in not only the Specification, but also, Applicants' Remarks in the 26 February 2003 Response to Office Action, the present invention is directed to supported *mesoporous* carbon membranes and is distinguished from the prior art supported *nanoporous* or *microporous* carbon membranes in that the prior art membranes have pore size distributions smaller than 2 nm. *See* Specification at 1; *see also*, 26 February 2003 Response to Office Action at 4. To distinguish the prior art membranes, Applicants further have added the specific limitation to pending claims 1, 16, 32, and 34 that the mesoporous carbon material has a pore size distribution mode in the mesoporous range of 2 nm to 50 nm. The amendments to claims 22 to 25 are editorial in nature and are intended to clarify that one embodiment of the present invention is directed to supported mesoporous carbon membranes that have a bimodal pore size distribution.

Support for all of the above amendments can be found in the Specification, in particular at page 4, ll. 14-25, and also in the attached IUPAC definition of "mesopore" which represents what one skilled in the art would consider to be the definition of mesopore. Accordingly, Applicants assert that no new matter has been added.

Claims 1-37 remain pending. In the Office Action of 06 May 2003, the Examiner rejected claims 1-37 as either anticipated by the prior art or obvious in view of the prior art. The Examiner further stated that the Applicants' arguments in response to the prior Office Action were not persuasive. Regarding the prior Office Action, dated, 26 September 2002, Applicants note that the Examiner has not maintained the rejection of claims 3, 5, 6, and 20 on the grounds of indefiniteness pursuant to 35 U.S.C. § 112, ¶ 2. Accordingly, Applicants assume that the indefiniteness rejection has been withdrawn. For the sake of clarity, Applicants respectfully request the Examiner to state for the record that the § 112 rejection has been withdrawn.

CLAIM REJECTIONS

The Examiner rejected claims 1, 3-6, 14-17, 22-26, and 32-36 as being anticipated by Rao et al., U.S. Patent No. 5,104,425 ("Rao") pursuant to 35 U.S.C. § 102(b).

The Examiner rejected claims 1-8, 14-18, 21-26, and 32-37 as being anticipated by Foley et al., U.S. Patent No. 5,972,079 ("Foley") pursuant to § 102(b).

The Examiner rejected claims 27, 30, and 31 as being anticipated by Lafyatis and Tung (1991), "Poly(Furfuryl Alcohol)-Derived Carbon Molecular-Sieves -- Dependence of Adsorptive Properties On Carbonization Temperature, Time, and Poly(Ethylene Glycol) Additives," *Industrial & Engineering Chemistry Research*, 30, 5, pp. 865-873 ["Lafyatis and Tung (1991)"] pursuant to § 102(b).

The Examiner next rejected claims 9-13, 28, and 29 as being unpatentable over Foley in view of Yoneyama et al., U.S. Patent No. 5,089,135 ("Yoneyama") pursuant to 35 U.S.C. § 103(a).

The Examiner next rejected claims 19 and 20 as being as being unpatentable over Foley in view of Lafyatis and Tung (1991) pursuant to § 103(a).

Applicants respectfully traverse these rejections for at least the following reasons.

ANTICIPATION REJECTIONS

In the present Office Action, the Examiner has made three anticipation rejections. First, the Examiner contended that claims 1, 3-6, 14-17, 22-26, and 32-36 are anticipated by Rao. To support this rejection, the Examiner assets that Rao discloses a carbon membrane comprising a support having through pores, a carbon material attached to the pores filling a portion of the pores, support pore sizes of from 0.1 to 50 μm, membrane pores sizes between 0.1 nm to 100 nm, tubular or flat disc membranes, mesocarbon material in the pores, and carbon attached to one surface of the support with carbon material partially filling the pores.

Applicants respectfully traverse this rejection for at least the following reasons. The claimed invention is directed to *mesoporous* supported carbon membranes. The specification and claims, as amended, clearly state that the mesoporous supported carbon membranes according to the invention comprise a mesoporous carbon material with a pore size distribution mode in the mesoporous range of 2 nm to 50 nm. Further, the specification states that the claimed membranes are intended for use in ultrafiltration applications (about 1 nm to 100 nm). Rao is entirely directed to nanoporous (less than 2 nm) membranes for use in gas separation (below 1 nm). Further, it is well-known in the art that nanoporous gas-phase separation membranes cannot be used for liquid or aqueous ultrafiltration applications as the pore size of nanoporous membranes

is too small for ultrafiltration applications. The specification of the present patent application clearly discloses this distinction. *See generally* Specification at 1 to 4.

The membranes taught by Rao are limited to the separation of non-condensible gas mixtures. Rao, Col. 6, ll. 60-64 and Col. 7, ll. 38-39 ("The membrane of the present invention is thus applied only to the separation of non-condensible gas mixtures."). These gas-phase membranes cannot be used for ultrafiltration purposes. *See* Specification at 4, ll. 8-15. Further, one skilled in the art would recognize the fundamental differences between the separation mechanism of the Rao nanoporous membrane compared to the claimed mesoporous membranes. The fundamental differences of nanoporous and mesoporous supported carbon membranes can be seen in Figures 4b and 4c which represent the flux vs. pressure performance of nanoporous (Figure 4b) and mesoporous (Figure 4c) membranes. *See also*, Specification at 13, ll. 27 to 4, ll. 9. Therefore, it is clear that one skilled in the art would readily recognize the distinction between the claimed mesoporous supported carbon membranes and the nanoporous membranes of Rao.

Additionally, the Examiner has both misrepresented the disclosure of Rao at Col. 8, ll. 10-18 and not considered the other disclosures in Rao regarding pore size. Initially, nowhere in Rao is it disclosed that the membrane pore size is in the range of from 0.1 to 100 nm as the Examiner contends. Rather, the pertinent disclosure in Rao regarding the pore size distribution of the disclosed membranes reads:

> The pore size distribution in the porous adsorptive material of the present invention is such that at least 10% of the pores are larger than the largest of the molecular diameters of the primary and secondary components to be separated, and that at least 50% of the pores are smaller than about five times this largest molecular diameter. Preferably, at least 90% of the pores are smaller than about three times this largest molecular diameter. These pore size distributions described herein are defined on a volume basis wherein a given percentage of the total pore volume of the porous solid is made up of pores larger or smaller than a given diameter.

See Rao at Col. 7, ll. 40-48. Clearly Rao is directed to gas-phase separation, Col. 7, ll. 38-39, thus the molecular diameters of the components to be separated are orders of magnitude smaller than the liquid-phase components that the present invention is intended to be used with, *see e.g.*, Specification at 17, ll. 20 to 22, ll. 19 (providing an example of the current invention used for dextran separation).

The portion of Rao relied upon by the Examiner relates to an example where the molecular diameter is 4.3 Å (0.43 nm). Using this molecular diameter, Rao discloses that at least 10% of the pores are larger than 4.3 Å (0.43 nm) and at least 50% are smaller than 21.5 Å (2.15 nm). *See* Rao, Col. 8, ll. 10-18. Further, Rao discloses that preferably, "at least 90% of the pores are less than 12.9 Å [1.29 nm] in diameter." *See id.* These teachings do not amount to anticipation of the claimed invention.

For a prior art reference to anticipate a claim, "the reference must disclose each and every element of the claim with sufficient clarity to prove its existence in the prior art." *Motorola, Inc. v. Interdigital Technology Corp.*, 121 F.3d 1461, 1472 (Fed. Cir. 1997) (citing *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) ("[T]he [prior art] reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it.")); *see also, In re Paulsen*, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994) (an anticipating reference must disclose "each and every limitation of the claimed invention[,] ... must be enabling[,] and [must] describe ... [the] claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention."). To anticipate, "[t]here must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention." *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991).

Rao does not anticipate simply because it does not disclose *mesoporous* supported carbon membranes where the mesoporous carbon material has a pore size distribution in the mesoporous range of 2 nm to 50 nm. Instead, Rao at best discloses only membranes having a minimum pore size where at least 10% of the pores larger than the largest molecular diameter to be separated (which is shown as 4.3 Å [0.43 nm] in Table 1) and that at least 50% of the pores are smaller than about five times this largest molecular diameter (which would be about 21.5 Å [2.15 nm] based on Table 1). *See* Rao, Col. 7, ll. 40 to Col. 8, ll. 18. These disclosures do not anticipate the rejected claims, because the rejected claims are all directed to a mesoporous supported carbon membrane where the mesoporous carbon material has a pore size distribution in the mesoporous range of 2 nm to 50 nm.. Rao only states that less than 50% of the pores are *smaller* than about 21.5 Å. This statement cannot be turned around, as the Examiner appears to contend, to mean that the remaining pores are all *larger* than 21.5 Å. While the membranes disclosed in Rao *may* have pores in the mesoporous range of 2 nm to 50 nm, there is no disclosure that there is a pore size distribution mode in the mesoporous region of 2 nm to 50 nm as required by the pending claims. Considering that Rao discloses that preferably 90% of the pores are smaller than 1.29 nm, Rao cannot anticipate the claim limitation of a pore size distribution mode in the nanoporous range of 2 nm to 50 nm. There is simply no basis for the Examiner's contention. In fact, it would be mere speculation that the carbon material disclosed in Rao would have a pore size distribution mode in the nanoporous range. It is well-settled that anticipation may not be based on speculation, possibilities, or probabilities. *See, e.g., In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981). Because the Examiner's anticipation rejection based upon the contention that Rao discloses membranes having a pore size distribution in the mesoporous region is built entirely upon speculation, it cannot stand.

In addition to the fact that Rao does not actually disclose *mesoporous* supported carbon membranes where the mesoporous carbon material has a pore size distribution in the mesoporous range of 2 nm to 50 nm, the Examiner also has not come forward with any evidence that the purported disclosures of Rao are enabling for producing the claimed *mesoporous* supported carbon membranes. Anticipation requires the asserted reference to be enabled for the *claimed* subject matter. *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000) ("[A]nticipation requires that the four corners of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention *without undue experimentation.*") (emphasis added). Rao, being directed to *nanoporous* membranes suitable only for gas-phase separations, lacks the requisite teachings to enable one skilled in the art to prepare the claimed *mesoporous* supported carbon membranes.

While Applicants do not have the burden to establish the non-enablement of Rao for the claimed mesoporous supported carbon membranes, Applicants not that objective evidence of non-enablement can be seen in a comparison of the methods to prepare both the Rao nanoporous membranes and the claimed mesoporous membranes. As stated in the specification, one of the aspects of the present invention is that the Applicants have developed a novel method to produce the claimed mesoporous membranes that involves both carbonizing and noncarbonizing polymer precursors. *See* Specification at 5, ll. 28 to 6, ll. 4 ("The mesoporosity of the membranes according to the present invention is produced in the carbon layer by the addition of a noncarbonizing templating polymer, such as poly(ethylene glycol) ('PEG'), to a nanoporous carbon precursor, *i.e.*, a carbonizing polymer precursor such as poly(furfuryl alcohol) ('PFA'), and pyrolyzing the polymeric precursors on a porous support."). Rao contains absolutely no

teaching regarding the combined use of carbonizing and noncarbonizing polymer precursors. Rather, Rao only discloses the use of carbonizing polymer precursors. *See* Rao at Col. 6, ll. 12-17. The Applicants have not found any evidence that the use of only carbonizing polymer precursors will result in mesoporous carbon membranes. *See* Specification at 4, ll. 8-14 ("[Nanoporous carbon] membranes cannot be used for ultrafiltration purposes because the pores are too narrow (generally less than 1 nm). The small scale of these pores requires transport of liquid feeds across the membrane to proceed by vaporization and adsorption at one boundary of the membrane, then migration of the adsorbed phase across the interior of the membrane, then evaporation at the other surface. Because of this adsorbed phase transport, the nanoporous membranes cannot transport and preserve liquid-phase components across the membrane.").

Additional objective evidence of non-enablement can be seen in Figure 9 of the present Application which shows that the pore size distribution of a membrane prepared using only a carbonizing polymer precursor, such as those disclosed by Rao. The pore size distribution for such carbon material, as seen in Figure 9, is substantially below 2 nm. In contrast, Figures 6, 7, and 8, which are produced with the Applicants' novel combination of the carbonizing and noncarbonizing polymer precursor to prepare the novel mesoporous carbon material, all show a second pore size mode in the range of 2 to 50 nm, which is not present in Figure 9. *See also* Specification at 16, ll. 24 to 17, ll. 2. Additionally, the mean effective pore size of each of the membranes shown in Figures 6, 7, and 8 is shown in Table A to all be greater than 10 nm. This objective evidence clearly establishes that Rao does not provide an enabled disclosure for mesoporous supported carbon membranes where the mesoporous carbon material has a pore size distribution in the mesoporous range of 2 nm to 50 nm.

Applicants recognize that the pending claims are not process claims, however, the substantial difference between the process of Rao and the Applicants' process is objective evidence that the teachings of Rao do not enable one skilled in the art to prepare mesoporous supported carbon membranes. Moreover, Figure 9, which represents a supported carbon membrane prepared according to Rao, *i.e.*, without a noncarbonizing polymer precursor, clearly shows that the pore size distribution is below 2 nm.

Concerning pending claims 22 to 25, Applicants note that Rao cannot anticipate because there is simply no disclosure whatsoever of a bimodal pore size distribution. The Examiner's rejection of these claims appears to be entirely based on speculation.

Concerning pending claims 32 and 33, Rao cannot anticipate because one skilled in the art would recognize that a nanoporous carbon membrane cannot be used to separate a macromolecular substance from a liquid. *See* Specification at 4, ll. 8-14.

Accordingly, for the above reasons, the claimed invention is not anticipated by Rao, as Rao neither discloses, nor enables one skilled in the art to produce, the claimed mesoporous supported carbon membranes where the mesoporous carbon material has a pore size distribution in the mesoporous range of 2 nm to 50 nm. Applicants respectfully request the rejection be withdrawn.

In the second anticipation rejection, the Examiner contends claims 1-8, 14-18, 21-26, and 32-37 are anticipated by Foley as the reference is purported to disclose a mesocarbon membrane supported on a porous stainless steel support with the carbon partially filling the pores. Foley was also purported to disclose operating temperatures greater than 200 °C, that the support was inherently rigid, had a porosity in the range of 0.1 to 100 μm, and a mesocarbon pore size in the range of 1 to 100 nm.

Applicants respectfully point out that the Examiner has again erred in the recitation of Foley's disclosure. Specifically, Foley does not disclose a "Mesocarbon pore from 1-100 nm" as purported by the Examiner. *See* Office Action of 06 May 2003 at 3. Rather, Foley discloses that the "nominal diameter of the pores in the CMS material is generally from 3-100 Å [0.3-10 nm]." *See* Foley, Col. 2, ll. 60-61. The other disclosures in Foley regarding the nominal diameter of the pores in the CMS material are that the pores may preferably be in the range of 0.3 nm to 2 nm, and most preferably 0.3 1 nm. *See* Foley at Col. 2, ll. 65-65.

Initially, the Examiner fails to recognize that Foley discloses that the pore sizes obtained from the pyrolysis of "non-graphitizing" polymers taught by Foley is between 4-6 Å (0.4-0.6 nm). *See* Foley at Col. 1, ll. 59 to Col. 2, ll. 3. Foley is directed to these non-graphitizing polymers. *Id.* When this portion of Foley is read in conjunction with the portion identified by the Examiner, it becomes clear that Foley -- while disclosing a CMS pore size in the range of 0.3 to 10 nm -- cannot be enabled for the full scope of this disclosed range as the pore size of the non-graphitizing polymers is limited to 0.4-0.6 nm.

Further, the pending claims, as amended, are directed to supported mesoporous carbon membranes where the mesoporous carbon material has a pore size distribution mode in the mesoporous region of 2 nm to 50 nm. While Foley mentions that the "nominal" pore size of the CMS is between 0.3 and 10 nm, this disclosure is silent whether there is a pore size distribution mode in the mesoporous region of 2 nm to 50 nm. The only relevant dictionary definition of "nominal" that would be applicable to Foley is "approximate." *See* Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Inc., Springfield, MA at 801 (1986). Thus, Foley's disclosure of "approximate" pore size cannot be equated to the claimed invention's requirement of a pore size distribution mode in the mesoporous range of 2 nm to 50 nm. As stated above,

anticipation cannot be based on speculation. Here, there is no evidence to suggest that Foley disclosed a pore size distribution mode in the mesoporous region. Rather, it appears that Foley simply states that the "nominal" size of the CMS pores may be anywhere in the range of 0.3 to 10 nm. This limited disclosure cannot be read to mean that there is a pore size distribution mode of the CMS pores in Foley in the range of 2 nm to 50 nm. Moreover, when one skilled in the art considers that non-graphitizing materials taught by Foley produce pore sizes in the range of 0.4 to 0.6 nm, it is clear that the CMS materials taught by Foley cannot have a pore size distribution mode in the mesoporous range of 2 nm to 50 nm. Thus, Foley does not disclose all the present claim limitations.

Additionally, for the same reasons as stated above for the Rao reference, Foley does not provide an enabling disclosure to prepare mesoporous supported carbon membranes. Foley only discloses membranes prepared with a single non-graphitizing polymer precursor, which is PFA, PAN, or PVDC or other similar polymers. *See* Foley at Col. 11, ll. 21-28. Applicants have explained in detail in the Specification that the claimed invention is prepared with a combination of a carbonizing polymer precursor such as PFA and a noncarbonizing polymer precursor such as PEG. *See* Specification at 5, ll. 28 to 6, ll. 4. While PFA and similar compounds are disclosed in Foley, there is absolutely no disclosure of using a noncarbonizing polymer precursor such as PEG. In fact, because the inventors have found that the noncarbonizing polymer precursor, *e.g.* PEG, is responsible for the pore size distribution mode in the mesoporous range for the membranes according to the present invention, Applicants assert that it would essentially be impossible to prepare the claimed membranes using the disclosures of Foley.

Concerning pending claims 22 to 25, Applicants note that Foley, like Rao above, cannot anticipate because there is simply no disclosure whatsoever of a bimodal pore size distribution. The Examiner's rejection of these claims appears to be entirely based on speculation.

Concerning pending claims 32 and 33, Foley, like Rao above, cannot anticipate because one skilled in the art would recognize that a nanoporous carbon membrane cannot be used to separate a macromolecular substance from a liquid. *See* Specification at 4, ll. 8-14.

Accordingly, for the above reasons, this rejection is improper and Applicants respectfully request it be withdrawn.

The last anticipation rejection raised by the Examiner in the 06 May 2003 Office Action is that claims 27, 30, and 31 are anticipated by Lafyatis and Tung (1991). The Examiner contends that Lafyatis and Tung (1991) discloses a process to prepare supported mesoporous carbon membranes by applying a coating comprising a noncarbonizing template polymer and a carbonizing polymer on a porous support and then pyrolyzing the applied coating. The Examiner further contends that Lafyatis and Tung (1991) discloses controlling the pore size by varying the molecular weight and amount of the noncarbonizing polymer precursor.

Claims 27, 30, and 31 are not anticipated by Lafyatis and Tung (1991) because the reference fails to disclose coating a porous support with the polymeric precursor mixture. Lafyatis and Tung (1991) only discloses the preparation and analysis of the carbon membrane, that is, the carbon material *without* a porous support. There is no disclosure of preparing the carbon membrane on a porous support. As stated above, anticipation requires that the reference discloses every claim element. Because the porous support is clearly a claim element not disclosed in Lafyatis and Tung (1991), the reference cannot anticipate claim 27, 30, and 31.

Applicants also assert that claim 31 is not anticipated by Lafyatis and Tung (1991) because the reference is completely silent as to varying the amount of noncarbonizing polymer precursor to control the pore size of the porous carbon layer. Every one of the PFA/PEG examples prepared in Lafyatis and Tung (1991) was prepared with a starting mix of 25% PEG and 75% PFA by weight. *See* Lafyatis and Tung (1991) at 866. The reference neither discloses nor suggests that the pore size of the porous carbon layer can be controlled by varying the amount of noncarbonizing polymer precursor (PEG). Accordingly, claim 31 is not anticipated by Lafyatis and Tung (1991).

In sum, for all the above reasons, Applicants respectfully request the withdrawal of the anticipation rejections.

OBVIOUSNESS REJECTIONS

A. Requirements for an obviousness rejection

An invention is invalid for obviousness if "differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a); *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351 (Fed. Cir. 2001).

In order to determine obviousness, the Examiner must make factual inquiries as to the following: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) secondary considerations of non-obviousness. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 662-63 (Fed. Cir. 2000); *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). Secondary considerations of non-obviousness

include commercial success, long-felt but unresolved need, failure of others, copying, and unexpected results. *See id.* These factual inquiries are commonly called the "*Graham*" findings.

When making an obviousness analysis based on prior art, the Examiner must not fall prey to a "hindsight syndrome" by reasoning backward from the teaching of the patent itself. *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000). According to the Federal Circuit, "the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references." *In re Gartside*, 203 F.3d 1305, 1319 (Fed. Cir. 2000); *see also B.F. Goodrich Co. v. Aircraft Braking Sys. Corp.*, 72 F.3d 1577, 1582 (Fed. Cir. 1996). In other words, something in the prior art, considered as a whole, must "suggest the desirability, and thus the obviousness, of making the combination" of different elements to create the invention. *See Fromson v. Advance Offset Plate, Inc.*, 755 F.2d 1549, 1556 (Fed. Cir. 1985) (citation omitted).

Accordingly, to make a determination regarding obviousness, the Examiner must make specific *Graham* findings. *See Ruiz*, 234 F.3d at 663. Further, where inventions are less technologically complex, the *Graham* findings are especially important. *Id.* (citations omitted). In such cases, "the danger increases that the very ease with which the invention can be understood may prompt one to fall victim to the insidious effect of hindsight syndrome wherein that which only the inventor taught is used against its teacher." *Id.* (internal quotations omitted).

1. Scope and Content of the Prior Art

The first *Graham* factor is directed towards the scope and content of the prior art. The Federal Circuit holds that the scope of the art, "includes art that is 'reasonably pertinent to the particular problem with which the invention was involved.'" *Ruiz*, 234 F.3d at 665 (quoting *Stratoflex Inc. v. Aeroquip Corp.*, 713 F.3d 1530, 1535 (Fed. Cir. 1983)). Prior art has been

defined as "knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." *See Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1453 (Fed. Cir. 1984).

To prevent a hindsight-based obviousness analysis, "the relevant inquiry for determining the scope and content of the prior art is whether there is a reason, suggestion, or motivation in the prior art or elsewhere that would have led one of ordinary skill in the art to combine the references." *Ruiz*, 234 F.3d at 664-65 (citations omitted).[1] The reason, suggestion or motivation to combine may be found either explicitly or implicitly: (1) in the prior references themselves; (2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or (3) from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem. *Ruiz*, 234 F.3d at 665 (citations and quotations omitted). While the references "need not expressly teach that the disclosure contained therein should be combined with another, [citation omitted], *the showing of combinability must be clear and particular.*" *Ruiz*, 234 F.3d at 665 (citation and internal quotations omitted) (emphasis added). "Broad conclusory statements regarding the teaching of multiple references, standing alone, are not 'evidence.'" *In re Dembiczak,* 175 F.3d 994, 1000 (Fed. Cir. 1999), *abrogated on other grounds by In re Gartside,* 203 F.3d 1305; *see also Upjohn Co. v. Mova Pharmaceutical Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000).

In addition to the requirement to show motivation to combine or modify the prior art references, the Examiner must show a reasonable expectation of success for the proposed

[1] Applicants note that the Federal Circuit has commented that while the assessment of whether motivation to combine or modify references is routinely viewed as a subset of the first *Graham* factor, an accurate assessment of whether there is motivation to combine or modify the references may require consideration of the other *Graham* factors. *See McGinley,* 262 F.3d at 1351 (citations omitted).

combination or modification. *In re Dow Chemical*, 837 F.2d 469, 473 (Fed. Cir. 1988). Reasonable expectation of success is assessed from the perspective of a person of ordinary skill in the art at the time the invention was made. *Life Technologies, Inc. v. Clontech Labs., Inc.*, 224 F.3d 1320, 1326 (Fed. Cir. 2000).

The above requirements have been developed so that Examiners do not fall victim to the use of hindsight in determining whether a claimed invention is obvious over the prior art. An obviousness determination requires, "the oft-difficult but critical step of casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, *guided only by the prior art references and then-accepted wisdom in the field.*" *Dembiczak*, 175 F.3d at 999 (emphasis added).

In particular, the Examiner "cannot use hindsight reconstruction to pick and chose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988). The combination of the various teachings of unrelated references, absent evidence of a suggestion, teaching or motivation to make such a combination, "simply takes the inventor's disclosure as a blueprint for piecing together the prior art -- the essence of hindsight." *Dembiczak*, 175 F.3d at 999.

2. The Differences Between the Claims and the Prior Art

Once the prior art is identified, the focus of the analysis centers on the differences between the claimed invention and the prior art. *See Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 1345 (Fed. Cir. 1984); *Ryko Mfg. Co. v. Nu- Star, Inc.*, 950 F.2d 714, 717 (Fed. Cir. 1991) ("When analyzing a patent claim for obviousness, the claim should be considered as a whole, but the [principal] differences between the [patented] claim and the prior art need to be identified."). The analysis centers on the ultimate legal question, "whether these differences are such that the

invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made." *TEC Systems, Inc.*, 725 F.2d at 1345.

3. The Level of Ordinary Skill in the Pertinent Art

There are six factors an Examiner should consider in determining the level of ordinary skill in the art: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) the prior art solutions; (4) the rapidity of innovation; (5) the sophistication of the technology at issue; and (6) the educational level of active workers in the field. *See Bausch & Lomb, Inc.*, 796 F.2d at 449-50.

4. Secondary Considerations of Nonobviousness

Objective indicia of nonobviousness must be considered before a conclusion on obviousness can be made. *See Hybritech,* 802 F.2d at 1380; Secondary considerations must be considered always, "not just when the decisionmaker remains in doubt after reviewing the art." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1539 (Fed. Cir. 1983). "Evidence of secondary conditions may often be the most probative and cogent evidence in the record." *Id.*

B. The Examiner's failed to establish a prima facie case of obviousness as there is no teaching or suggestion in the prior art to make the purported combination of references

Applicants traverse the Examiner's obviousness rejections for at least two reasons: (1) the Examiner failed to make the necessary detailed *Graham* findings; and (2) had proper *Graham* findings been made, it would be clear that the Examiner's failed to establish a prima facie case of obviousness because there is no teaching, suggestion, or motivation in the prior art to make the purported combination or modification of references. Because no prima facie case of obviousness has been presented, Applicants do not have the burden to present rebuttal evidence of nonobviousness. *See* MPEP § 2142 at 2100-123 (Feb. 2003).

In the 06 May 2003 Office Action, the Examiner made two rejections on the grounds the claimed invention is obvious over the prior art. First, the Examiner rejected claims 9-13, 28, and 29 as unpatentable over Foley in view of Yoneyama. The Examiner contends that Foley teaches a supported mesocarbon membrane as in claim 1 and Yoneyama teaches a carbon membrane having a water permeability in the range of claim 9. The Examiner purported that it would have been obvious for one of ordinary skill in the art at the time of the invention to use the teaching of Foley with Yoneyama to make a supported carbon membrane for water permeation and liquid filtration purposes. For claims 10-13, the Examiner recognizes that neither Foley nor Yoneyama discloses BSA retention. However, the Examiner contends that the BSA retention limitations of these claims would be inherently present in the purported combined teachings. For claims 28 and 29, the Examiner recognizes that Foley does not teach a process of filtering a substance in a liquid, however, Yoneyama teaches filtering liquids with mesoporous carbon membranes, therefore, the Examiner purports that it would be obvious to one skilled in the art to use the Foley membrane for filtering liquids.

All of the Examiner's claim rejections based upon the purported combination of Foley and Yoneyama are improper because there simply is no suggestion or motivation in either the references themselves or in the knowledge generally available to one skilled in the art to combine the references. Thus, there can be no prima facie case of obviousness. *See* MPEP § 2142 at 2100-124 (Feb. 2003).

The Examiner has the initial burden to show, apart from the Applicants' own invention, the teaching, suggestion, or motivation to make the purported combination. The Examiner has failed to meet this burden. Foley is unquestionably *entirely* directed to supported CMS membranes having a graphite-like structure that is only suitable for gas-phase separation. There

simply is no teaching or suggestion in Foley to use the disclosed CMS membranes for liquid-phase ultrafiltration applications. In fact, as the Applicants have stated in the Specification, these prior art CMS membranes cannot be used for ultrafiltration applications. *See* Specification at 4, ll. 8-9. Yoneyama is directed to porous hallow polymer *fibers* that are formed by combining (A) acrylonitrile and (B) a heat-decomposable polymer and (C) a solvent, spinning the mixture and then subjecting the spun fibers to an oxidizing treatment and then finally carbonizing the fibers. *See* Yoneyama at Col. 3, ll. 15-26. There is no teaching or suggestion in Yoneyama to employ a porous support as disclosed in Foley. Rather, the reference is limited to carbonized spun fibers. There simply is no logical basis to make the purported combination.

Furthermore, the Examiner has identified no evidence to establish that there is a reasonable expectation that a membrane could either be successfully prepared from the from the purported combination of the polymeric composition disclosed in Yoneyama applied to the porous support disclosed in Foley or that such a membrane would even be suitable for ultrafiltration applications. Accordingly, for the above reasons, the Examiner's obviousness rejection based on the combination of Foley and Yoneyama is without basis, is without reasonable expectation of success, and appears to be the product of hindsight. Accordingly, Applicants respectfully request the rejection be withdrawn.

The Examiner last rejected claims 19 and 20 as unpatentable over Foley in view of Lafyatis and Tung (1991). The Examiner contends that Foley discloses all the limitations of claim 18, and that claims 19 and 20, which are dependent on claim 18, are directed to the use of PEG as the noncarbonizing template polymer precursor. The Examiner contends that Lafyatis and Tung (1991) discloses PEG as a noncarbonizing polymer precursor.

Initially, Applicants note that Foley does not disclose or teach the use of both a carbonizing and noncarbonizing polymers to prepare the membranes as the Examiner contends. Foley is limited only to non-graphitizing polymers, which would comparable to the claimed carbonizing polymers. The Examiner has not specifically identified the teaching in Foley where it is contended that both carbonizing and noncarbonizing polymers are used to prepare supported mesoporous carbon membranes. Applicants note that Foley does not disclose or teach the Applicant's combination of carbonizing and noncarbonizing polymers.

The obviousness rejection cannot stand for the same reasons as stated above as there simply is no teaching, suggestion, or motivation in the references or the knowledge generally available to one skilled in the art to make the Examiner's purported combination. Thus, there is no prima facie case of obviousness. As stated above, Lafyatis and Tung (1991) does not disclose the use of a porous support. Foley does not disclose the use of noncarbonizing polymers or PEG. There is simply no teaching in the references to make the proposed combination.

Further, in an obviousness rejection, the Examiner is required to consider the teachings of the entire reference as a whole. *See Vandenberg v. Dairy Equipment Co.*, 740 F.2d 1560, 1564 (Fed. Cir. 1984) (citing *In re Shuman*, 361 F.2d 1008, 1012 (CCPA 1966)). Here, both of the cited references are directed to membranes intended for *gaseous* applications. The claimed invention, as a whole, is directed to supported mesoporous carbon membranes intended for *liquid* ultrafiltration applications. It cannot be said that one skilled in the art in developing an liquid ultrafiltration membrane would look to references limited to membranes for gaseous applications, let alone combine two such references as the Examiner has done.

Accordingly, for the above reasons, the obviousness rejection lacks proper foundation and Applicants respectfully request the rejection be withdrawn.

Applicants believe no extension of time for response is due with this paper. However, if an extension of time under 37 C.F.R. § 1.136 not accounted for above is necessary for consideration of this paper, such an extension is requested and the fee should also be charged to our Deposit Account No. 03-2775. If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account.

The prior art made of record and not relied upon does not disclose or suggest the invention of the present claims.

Respectfully submitted,

Dated: 06 August 2003

By: _____
Daniel C. Mulveny
Reg. No. 45,897

Enclosure: Exhibit A

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mesopore (in catalysis)
Pore of intermediate size. [Those with widths exceeding about 0.05 μm or 50 nm (500 Å) are called macropores; those with widths not exceeding about 2 nm (20 Å) are called micropores].
1972, *31*, 585; 1976, *46*, 79